1. System of Linear Equations

Three points uniquely determine a degree 2 polynomial. Given the three points \( (x_1, y_1) = (-1, 2), (x_2, y_2) = (1, -2), (x_3, y_3) = (2, 5) \) we wish to find the unique polynomial \( p(x) = a_2x^2 + a_1x + a_0 \) such that \( p(x_i) = y_i \).

In this question we will find \( p(x) \) by solving a system of linear equations:

(a) Write out an equation in terms of \( a_0, a_1, a_2 \) for \( p(-1) \), or the polynomial \( p(x) \) evaluated at \( x = -1 \).

(b) Write out an equation in terms of \( a_0, a_1, a_2 \) for \( p(1) \), or the polynomial \( p(x) \) evaluated at \( x = 1 \).

(c) Write out an equation in terms of \( a_0, a_1, a_2 \) for \( p(2) \), or the polynomial \( p(x) \) evaluated at \( x = 2 \).

(d) Solve the system of linear equations from parts (a)-(c) to determine the values of \( a_0, a_1, a_2 \).